Patent Claims

1. A method for fabricating a reference layer for MRAM memory cells,

f e a t u r i n g the following steps:

(A) a layer system is provided for the reference layer, which layer system has a first layer (10; 100) of a material having a first Curie temperature (T_C^1), which first layer can be permanently magnetized by an external magnetic field, and a second layer (11; 101) of a material having a second Curie temperature (T_C^2), which is significantly lower than the first Curie temperature (T_C^1), which second layer can be magnetized by antiferromagnetic coupling with the first layer;

(B) an external magnetic field (B1) is generated;

(C) the layer system (R; R') is cooled from a temperature above the first Curie temperature (T_C^1) to below the first Curie temperature (T_C^1) by action of the external magnetic field (B1), the field strength of the external magnetic field (B1) being greater than the saturation field strength of the first layer (10; 100), so that the magnetization of the first layer (10; 100) is oriented by a second-order phase transition along the field direction of the external magnetic field; and

(D) the layer system (R, R') is subsequently cooled below the second Curie temperature (T_C^2), the magnetization of the second layer (11; 101) being oriented antiparallel with respect to the magnetization of the first layer (10; 100) on account of antimagnetic coupling between the first and second layers (10; 100 and 11; 101).

2. The fabrication method as claimed in claim 1,

w h e r e i n

the net magnetization of the layer system (R; R') is set through the choice of the saturation flux, in particular of the layer cross section in each case of the first and second layers (10; 100 and 11; 101).

3. The fabrication method as claimed in claim 1 or 2,
w h e r e i n
the net magnetization of the layer system (R; R') is set to zero by the respectively identical net magnetization of the first layer (10; 100) and the second layer (11; 101).

4. The fabrication method as claimed in claim 1 or 2,
w h e r e i n
the net magnetization of the layer system (R; R') is set to be not equal to zero through selection of the second layer (11) such that the layer cross section thereof is smaller than that of the first layer (10; 100).

5. The fabrication method as claimed in one of the preceding claims,
w h e r e i n
in step (D), upon passing through the second Curie temperature (T_C^2), an external magnetic field (B2) is applied whose field direction is opposite to the magnetization direction of the first layer (10; 100).

6. The fabrication method as claimed in one of claims 1 to 5,
w h e r e i n
in step (A), a layer system (R') is provided which has a very thin intermediate coupling layer (102) between the first and second layers (100 and 101), and the antiferromagnetic coupling in step (D) is imparted by the intermediate coupling layer (102).

7. The fabrication method as claimed in one of claims 1 to 6,
w h e r e i n
the material of the first layer (10; 100) is chosen from the group comprising $(Co,Fe,Mn)_{80}(Si,B)_{20}$; $(Co,Fe)_{83}(Si,B)_{17}$; $Tb_{20}Fe_{40}Co_{40}$,
and the material of the second layer is chosen from the group comprising $(Co,Fe,Mo)_{73}(Si,B)_{27}$; $(Ni,Fe)_{78}(Si,B,C)_{22}$; $Tb_{20}Fe_{80}$.

8. The fabrication method as claimed in claim 7,
w h e r e i n
the material of the intermediate coupling layer (102) is chosen from the group comprising ruthenium, copper, gold.

9. An MRAM memory cell,
w h e r e i n
it has a reference layer comprising a layer system (R; R'), which has a first layer (10; 100) of a material having a first Curie temperature (T_C^1) and a second layer (11; 101) of a material having a second Curie temperature (T_C^2), which is significantly less than the first Curie temperature (T_C^1), and
the reference layer is fabricated by the method described in one of claims 1 to 8.